



## **Insects Associated with Decomposing Pig Carrions in Okija, Anambra State, Nigeria.**

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### **ABSTRACT**

Insects associated with decomposing pig carrions were studied in an open fallow plot in Okija, Anambra state, Nigeria. The decomposition process of the carrions took sixteen days in the four phases - fresh, bloated, active and dry decay stages. Six orders of insects- Diptera, Coleoptera, Hymenoptera, Hemiptera, Orthoptera and Dictyoptera were collected on the carrions. The sarcophagids and calliphorids were the first to arrive on the carrions and deposited their first instar larvae and eggs respectively, few hours after death, during the fresh stage. The dermestids and clerids arrived on the carrions few days after death during the bloated stage. The ulidiids and stratiomyiids arrived on the carrions during the active decay stage. The insect species composition on the carrions peaked during the active decay stage. The larvae of these insects fed voraciously on the carrions, which led to faster decomposition of the carrions. The arrival of the dipterans and the coleopterans were predictable and their importance as forensic insects were discussed. The probable reason for the occurrence of hymenopterans, hemipterans, orthopterans and dictyopterans on the carrions were also given.

**Keywords:** Insects; Carrions; Decomposition Phases, Okija.

### **INTRODUCTION**

The scientific study of insects has become inevitable because they are the most diversified animals ever known to man. As a group, they have become one singular factor that has influenced the entire life system (Omoloye, 2008).

Insects contribute very immensely to the continuity of the earth as they pollinate, eat other arthropods, both living plants and animals as well as their dead remains (Ekarakene and Iloba, 2011). Some insects are referred to as carrion feeders and thus, play prominent role in the decomposition of carrions. The study of these carrion feeders constitutes the branch of science called

Forensic Entomology. According to Williams and Villet (2006), it implies the study of insects for their use in legal investigations.

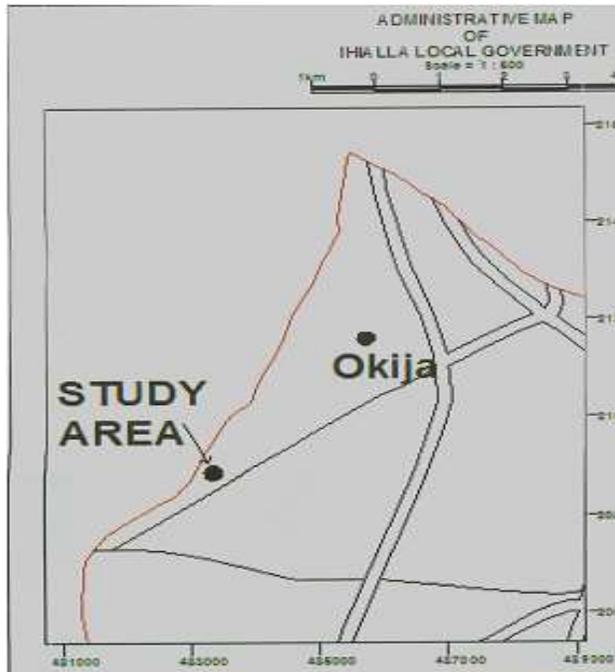
In Nigeria, studies relating to Forensic Entomology are few (Usua, 2007). Thus, Forensic Entomology has not been applied in the investigation of several cases of homicide and mysterious death. The cases that were investigated rely mainly on evidence given by human beings, ignoring the fact that insects found on dead bodies are silent witness to homicide cases. This challenge necessitated the study of the insects associated with pig carrions in Okija, Anambra State, Nigeria. This is because the pig carrion can serve as a temporary

resource exploited by wide diverse organisms, ranging from microbes through invertebrates to vertebrate scavengers. The study however concentrated on the insect fauna associated with the decomposing pig carrions. It involved recording their arrival time as well as observing their activities on the carrions.

## MATERIALS AND METHODS

### Study Site

The study was carried out between January and May, 2012 in an open fallow plot; 05 ° 53.240N and 006 °48.50 E, in Ubahueze village, Ihite-Okija. Okija is a town in Ihiala Local Government Area of Anambra State, Nigeria. The vegetation in Okija is derived tropical savanna with patches of forest and palm trees. The topography is a combination of high and lowlands with Umuhu and Ubahueze villages constituting the lowlands. The temperature in Okija ranges from 26°C to 30°C with wet and dry seasons in a yearly cycle (Chidi, 2010).



**Fig.1:** Map showing Ubahueze Okija in Ihiala Local Government Area, Anambra State, Nigeria.

### Experimental Animal

Six healthy white pigs (*Sus scrofa* Linn.) with mean weight of  $24.8 \pm 0.9$ kg, were used as recommended by Catts and Goff (1992), as being suitable as a model for human decomposition. The pigs were purchased from a piggery in Umuogu village, Okija.

The pigs were killed by 18:30 hours, washed with clean water, placed in a polyester sack and transported without delay to the fallow plot. The six pigs were grouped into two. Each group of three pigs was deposited three metres apart, and five metres apart between groups. The pig carrions were guarded against vertebrate scavengers with wire mesh that permits entrance of all insects and other arthropods. The wire mesh was used to form cylindrical cages (height 83cm and diameter 80cm) supported with cement blocks.

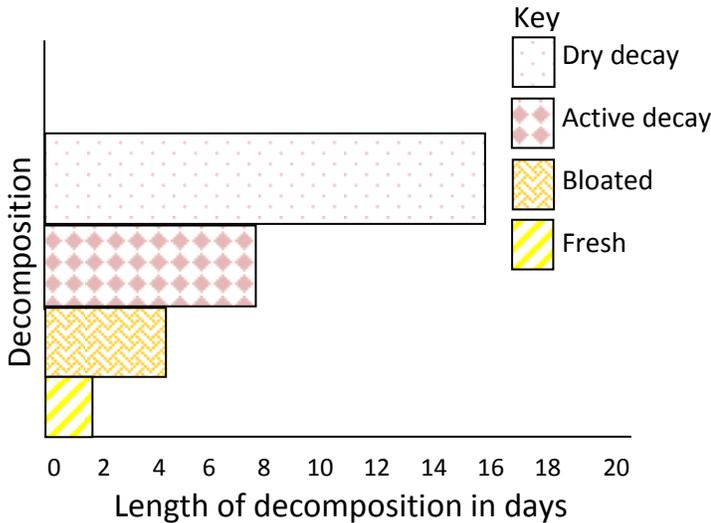
### Insect Collection

Before daily collection, the decomposition state of the carrions was noted. The cages and the cement blocks were set aside so that flying and crawling insects on the carrions could easily be collected with sweep net and a pair of blunt forceps. The insects were preserved in 70% ethanol. They were later sorted into their taxonomic group in the Zoology Laboratory, Nnamdi Azikiwe University, Awka and sent to Insect Museum, Institute of Agricultural Research, Ahmadu Bello University, Zaria for identification of the species.

## RESULTS

The decomposition process of the carrions took sixteen days, in four distinguished phases - fresh decay which was less than 24 hours, while bloated decay

occurred from the 2<sup>nd</sup> day to the 4th day. Active decay occurred from the 5th day to the 8th day. Dry decay lasted from the 9<sup>th</sup> day to 16th day of the decomposition process. The skeletonization process of the carrions was beyond 122 days (Fig. 1).



**Fig. 1:** Average Length of Time in Days Taken by the Pig Carrions to Decompose in the Fallow Plot in Okija, Anambra State.

Insects associated with the decomposition phases of the carrions were collected and identified. This consists of 31 species, 21 families and six Orders (Table 1)

**TABLE 1:** Insects Collected on the Pig Carrions at Different Phases of Decomposition in the fallow plot in Okija, Anambra state, Nigeria.

Decomposition Phases	Insect Species collected
FRESH	<i>Chrysomya albiceps</i> (Wied.), <i>C. chloropyga</i> (Wied.), <i>C. regalis</i> (Rob-Desv.), <i>Isomyia dubiosa</i> (Villen.), <i>Isomyia</i> sp., <i>Sarcophaga inzi</i> (Curran), <i>Ocypus raffrayi</i> (Fauvel), <i>Oecophylla longinoda</i> (Latr.), and <i>Paratrechina</i> sp.
BLOATED	<i>Chrysomya albiceps</i> (Wied.), <i>C. chloropyga</i> (Wied.), <i>C. regalis</i> (Rob-Desv.), <i>Isomyia dubiosa</i> (Villen.), <i>Isomyia</i> sp., <i>Sarcophaga inzi</i> (Curran), <i>Musca domestica</i> (Linn.), <i>Trirhithum</i> sp., <i>Dermestes frischii</i> (Kug), <i>Necrobia rufipes</i> (Deg.), <i>N. ruficollis</i> (Fab.), <i>Buphonella</i> sp., <i>Hipocacculus</i> sp.,

ACTIVE DECAY

*Camponotus perrisi* (For.), *Ceratocoris bucephalus* (White), and *Riptortus dentipes* (Fab).

DRY DECAY

*Chrysomya albiceps* (Wied.), *C. chloropyga* (Wied.), *C. regalis* (Rob-Desv.), *Isomyia dubiosa* (Villen), *Isomyia* sp., *Sarcophaga inzi* (Curran), *Oecophylla longinoda* (Latr.), *Paratrechina* sp., *Musca domestica* (Linn.) *Trirhithum* sp., *Dermestes frischii* (Kug), *Necrobia rufipes* (Deg.), *N. ruficollis* (Fab.), *Buphonella* sp., *Hipocacculus* sp., *Camponotus perrisi* (For.), *Ceratocoris bucephalus* (White), and *Riptortus dentipes* (Fab).

*Chrysomya albiceps* (Wied.), *C. chloropyga* (Wied.), *C. regalis* (Rob-Desv.), *Isomyia dubiosa* (Villen), *Isomyia* sp., *Sarcophaga inzi* (Curran), *Oecophylla longinoda* (Latr.), *Paratrechina* sp., *Musca domestica* (Linn.) *Trirhithum* sp., *Dermestes frischii* (Kug), *Necrobia rufipes* (Deg.), *N. ruficollis* (Fab.), *Buphonella* sp., *Hipocacculus* sp., *Camponotus perrisi* (For.), *Ceratocoris bucephalus* (White) *Riptortus dentipes* (Fab.), *Chrysomya africana* (Hendel), *Hermetia illucens* (Linn.), *Angionychus lividus* (Klug.), *Gymenopleurus* sp. and *Pheidole* sp.

During the fresh stage, insects collected were *Chrysomya albiceps*, *Chrysomya Chloropyga*, *Chrysomya regalis*, *Isomyia dubiosa*, *Isomyia* sp., and *Sarcophaga inzi*. Others include *Ocypus raffrayi*, *Oecophylla longinoda* and *Paratrechina* sp. The number of the insects at this stage was few.

All the calliphorids, sarcophagids and the formicids were collected at the bloated stage. Other species collected at this stage include *Musca domestica*, *Trirhithum* sp., *Dermestes frischii*, *Necrobia rufipes*, *N. ruficollis*, *Buphonella* sp., *Zophosis* sp., *Hipocacculus* sp., *Hister* sp., *Camponotus perrisi*, *Ceratocoris bucephalus* and *Riptortus dentipes*. The number of adult calliphorids sporadically increased at this stage. Sarcophagids, muscids, tephritids, dermestids and clerids were not sporadic, but slightly increased.

The insect species composition in the active decay stage was not different from those collected during the bloated stage. However, the number of *Buphonella* sp.,

*Zophosis* sp., *Hister* sp., *Camponotus perrisi*, *Ceratocoris bucephallus* and *Riptortus dentipes* were very few.

During the dry decay stage, insects collected were *Chrysomyza africana* *Hermetia illucens*, *Angionychus lividus*, *Gymenopleurus* sp. and *Pheidole* sp.

Insects observed on the carrions during the skeletonization process were larvae of Ulidiidae, Stratiomyiidae, Dermestidae, and Cleridae. Adult insects observed were Cleridae, Dermestidae, Sarcophagidae, Muscidae, Formicidae, Tiphiidae, Coreidae, Gryllidae, Pygomorphidae and Mantidae.

Only the Sarcophagidae, Calliphoridae, Ulidiidae, Stratiomyiidae, Muscidae, Dermestidae, Cleridae, representatives of five dipteran and two coleopteran laid their eggs on the carrions. It took the calliphorids 8 days, sarcophagids 16 days, muscids 31 days, ulidiids 22 days and stratiomyiids 33 days to complete their life cycle on the carrions during the decomposition and skeletonization processes. The sarcophagids and calliphorids which were the first to arrive, deposited their first instar larvae and eggs respectively on the carrions during the fresh decay. The ulidiids and stratiomyiids laid their eggs during the dry decay stage. The dermestids laid eggs on the carrions during the active decay stage while the clerids laid their eggs during the dry decay stage. Other insect orders namely the hymenopterans, hemipterans, orthopterans and dictyopterans collected during the study period did not breed on the carrions and their direct activities on the carrions were not obvious. The activities of the dipterans and coleopterans include consumption of the carrion tissues and laying of eggs on the carrions. The feeding activities of the dipteran larvae and adult beetles led to faster

decomposition of the carrions. The feeding activities of the beetle larvae and their adults skeletonized the carrions.

## DISCUSSION

In the tropics, air temperature and relative humidity is usually high. The decomposition of the carrions was faster. This result was obvious in the present study and agrees with Ekanem and Dike (2010) report that higher air temperature leads to faster chemical reactions and increase insects abundance. Thus, the decomposition rate of the carrions was faster as a result of high temperature, relative humidity and insect abundance. This is accentuated by high fecundity of the flies and the beetles. The decomposition rate of carrion in the temperate was slower as recorded by Wolff *et al.* (2001).

Dead animals, including human beings, begin to deteriorate minutes after death due to physiological changes, which have come to a halt thus, leading to putrefaction. Insects, especially flies, are evidence of this deterioration as they are the first to detect this change and arrive on the carrions. They lay eggs on the carrions which hatch within hours into larvae that feed voraciously on the carrion tissues, thus leading to faster decomposition of the carrions. In addition, beetles arrive on the carrions few days after death to feed on the soft and dried tissues, which skeletonized the carrions. The ages of these insects on the carrions have the potentials to offer forensic investigators an estimation of the time since death or the post mortem interval of carrions or corpses (Gennard, 2007). Carrion insects are decomposition stage dependent (Gill, 2005). Earlier researchers such as Goff and Odum, 1987; Lord *et al.*, 1993; Goff and Win, 1997; Richards and Goff, 1997; Benecke, 1998; Greenberg and Wells, 1998; Bharti and Singh, 2003) have identified

some of the insects collected in this study as insects of forensic importance. These include

*C. albiceps*, *C. chloropyga*, *C. regalis*, *Isomyia dubiosa*, *Isomyia* sp., *S. inzi* and *H. illucens*. In addition, *C. africana* has similar potentials as the

*H. illucens*. Others were *D. frischii* and *N. rufipes*. *N. ruficolis* collected alongside *N. rufipes* and both have the same characteristics in their ability to invade carrions. Other insects collected in the study such as the reproductive stages of the tephritids, gryllids, pyrgomorphids, tiphiids, coreids, plataspid, alydiids and mantids were not identified as forensic insects. However, they have been classified either as predators, cryptozoic or parasitoid found on carrions (Keh, 1985). They were incidental and opportunistic species which took advantage of the resource in the fallow plot.

## CONCLUSION

The observation of the study has led to the conclusion that, insects associated with carrions play prominent role in their decomposition. This decomposition role has however, proved that insects found on the decomposing carrion if properly studied, can estimate when the carrion(s) died. This vital information is a tool in Entomology towards solving problems relating to homicide cases. This is true when the carrion undergoes natural decomposition without being altered in any form that disrupts decomposition sequence.

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